



# STGP10N60L

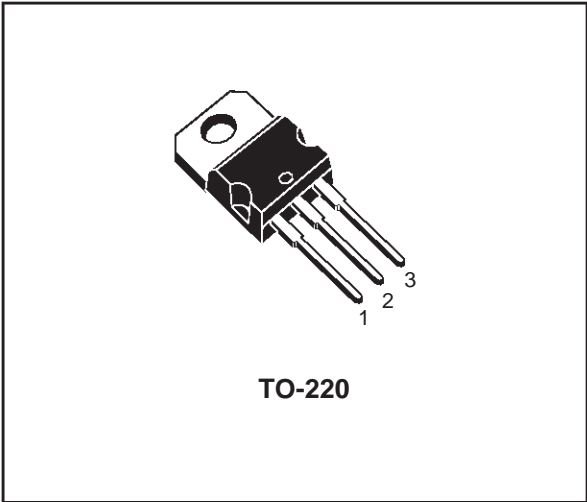
N-CHANNEL 10A - 600V TO-220  
LOGIC LEVEL IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGP10N60L	600 V	< 1.95 V	10 A

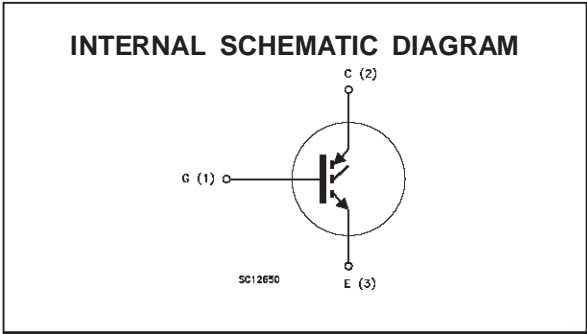
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- LOW THRESHOLD VOLTAGE (LOGIC LEVEL INPUT)
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT

### APPLICATIONS

- ELECTRONIC IGNITION
- LIGHT DIMMER
- STATIC RELAYS



TO-220



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V
V <sub>ECR</sub>	Reverse Battery Protection	25	V
V <sub>GE</sub>	Gate-Emitter Voltage	± 15	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 25 °C	25	A
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 100 °C	20	A
I <sub>CM</sub> (•)	Collector Current (pulsed)	100	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	125	W
	Derating Factor	0.83	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

## STGP10N60L

### THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	1.2	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max	62.5	°C/W
R <sub>thc-sink</sub>	Thermal Resistance Case-sink	Typ	0.1	°C/W

### ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = - 40 to 150 °C unless otherwise specified)

#### OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>BR(ces)</sub>	Collector-Emitter Breakdown Voltage	I <sub>C</sub> = 250 μA V <sub>GE</sub> = 0	600			V
I <sub>CES</sub>	Collector cut-off (V <sub>GE</sub> = 0)	V <sub>CE</sub> = Max Rating T <sub>j</sub> = 25 °C V <sub>CE</sub> = Max Rating T <sub>j</sub> = 125 °C			25 100	μA μA
I <sub>GES</sub>	Gate-Emitter Leakage Current (V <sub>CE</sub> = 0)	V <sub>GE</sub> = ± 15 V V <sub>CE</sub> = 0			± 100	nA

#### ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GE(th)</sub>	Gate Threshold Voltage	V <sub>CE</sub> = V <sub>GE</sub> I <sub>C</sub> = 250 μA V <sub>CE</sub> = V <sub>GE</sub> I <sub>C</sub> = 250 μA T <sub>j</sub> = 25 °C	0.6 1.0		2.4 2.0	V V
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	V <sub>GE</sub> = 4.5 V I <sub>C</sub> = 8 A T <sub>j</sub> = - 40 °C V <sub>GE</sub> = 4.5 V I <sub>C</sub> = 9.5 A T <sub>j</sub> = 25 °C V <sub>GE</sub> = 4.5 V I <sub>C</sub> = 8 A T <sub>j</sub> = 150 °C		1.5 1.4 1.25	2.0	V V V
I <sub>C</sub>	Collector Current	V <sub>GE</sub> = 4.5 V V <sub>CE</sub> = 7 V	15	45		A

#### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub>	Forward Transconductance	V <sub>CE</sub> = 25 V I <sub>C</sub> = 8 A T <sub>j</sub> = 25 °C	7	12		S
C <sub>ies</sub> C <sub>oes</sub> C <sub>res</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>CE</sub> = 25 V f = 1 MHz V <sub>GE</sub> = 0		1800 120 19	2600 165 26	pF pF pF
Q <sub>G</sub>	Gate Charge	V <sub>CE</sub> = 400 V I <sub>C</sub> = 8 A V <sub>GE</sub> = 5 V		30		nC

#### FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CL</sub>	Latching Current	V <sub>clamp</sub> = 480 V dV/dt = 200 V/μs T <sub>j</sub> = 125 °C	20			A
E <sub>CF</sub>	Forward Clamping Energy	T <sub>start</sub> = 55 °C V <sub>clamp</sub> = 480 V I <sub>C</sub> = 10 A L = 4.2 mH - Single Pulse	210			mJ
E <sub>AR</sub>	Reverse Avalanche Energy		10			mJ

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Delay Time	$V_{CC} = 480\text{ V}$		0.7		$\mu\text{s}$
$t_r$	Rise Time	$I_C = 8\text{ A}$ $V_{GE} = 5\text{ V}$ $R_G = 1\text{ K}\Omega$		1.9		$\mu\text{s}$
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480\text{ V}$ $R_G = 1\text{ K}\Omega$ $T_j = 125\text{ }^\circ\text{C}$		5		$\text{A}/\mu\text{s}$
$E_{on}$	Turn-on Switching Losses			2.5		mJ

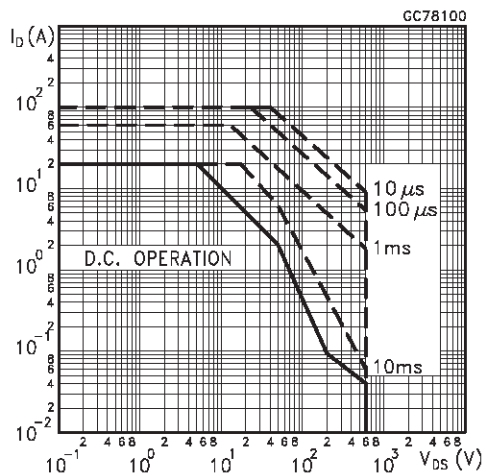
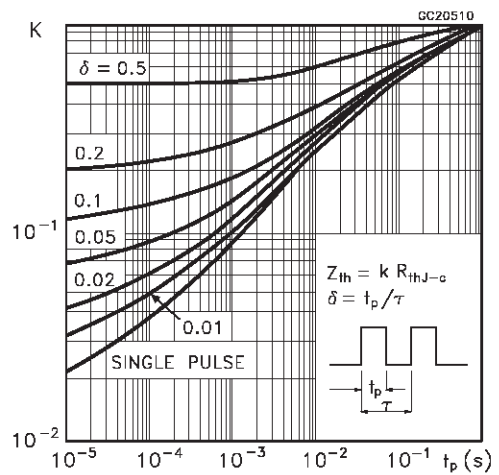
**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-Over Time	$V_{CC} = 480\text{ V}$ $R_{GE} = 1\text{ K}\Omega$ $T_j = 25\text{ }^\circ\text{C}$		4		$\mu\text{s}$
$t_r(v_{off})$	Off Voltage Rise Time	$I_C = 8\text{ A}$ $V_{GE} = 5\text{ V}$		2.5		$\mu\text{s}$
$t_f$	Fall Time			1.5		$\mu\text{s}$
$E_{off}(^{**})$	Turn-off Switching Loss			9.0		mJ
$t_c$	Cross-Over Time	$V_{CC} = 480\text{ V}$ $R_{GE} = 1\text{ K}\Omega$ $T_j = 125\text{ }^\circ\text{C}$		6		$\mu\text{s}$
$t_r(v_{off})$	Off Voltage Rise Time	$I_C = 8\text{ A}$ $V_{GE} = 5\text{ V}$		3.3		$\mu\text{s}$
$t_f$	Fall Time			2.5		$\mu\text{s}$
$E_{off}(^{**})$	Turn-off Switching Loss			10.8		mJ

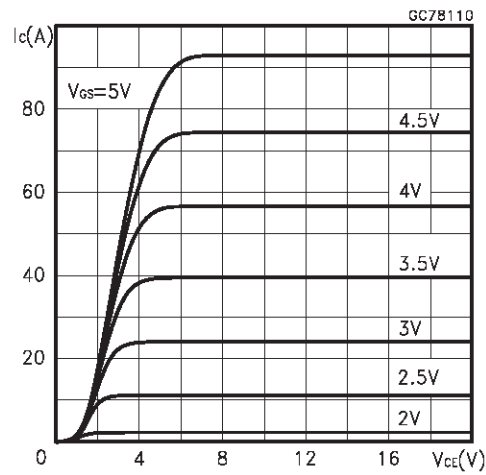
(•) Pulse width limited by safe operating area

(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

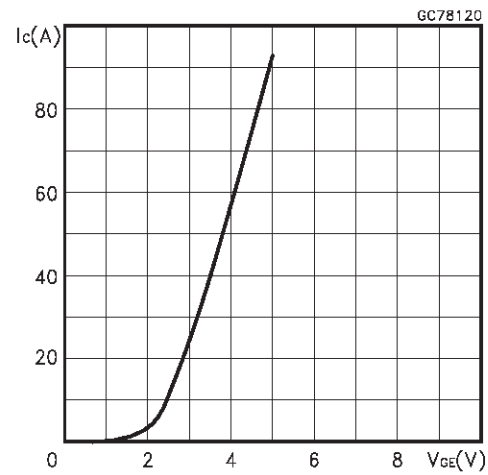
(\*\*) Losses Include Also The Tail (Jedec Standardization)

**Safe Operating Area****Thermal Impedance**

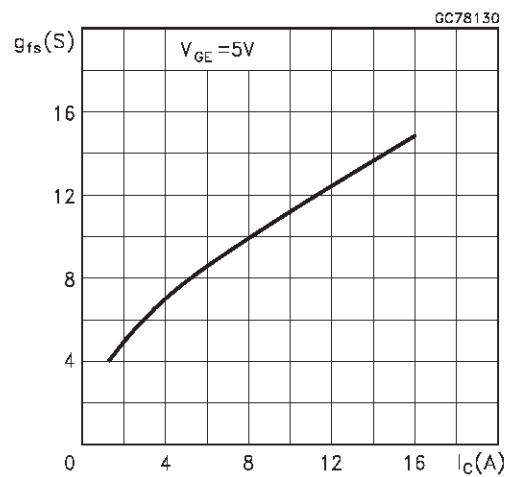
Output Characteristics



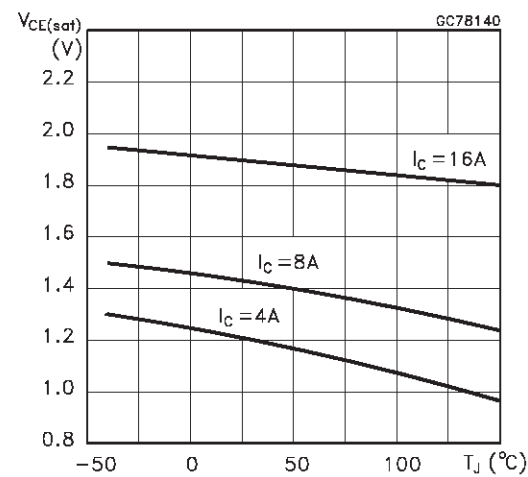
Transfer Characteristics



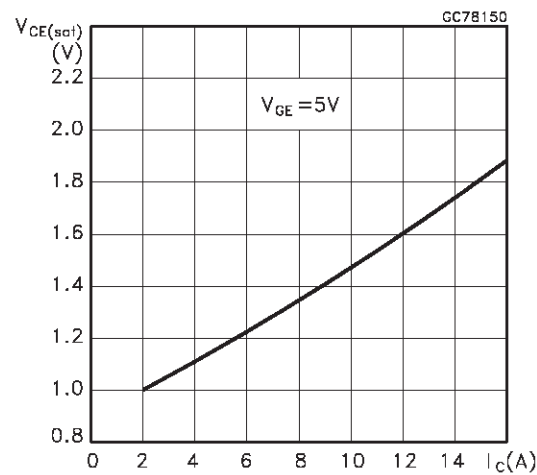
Transconductance



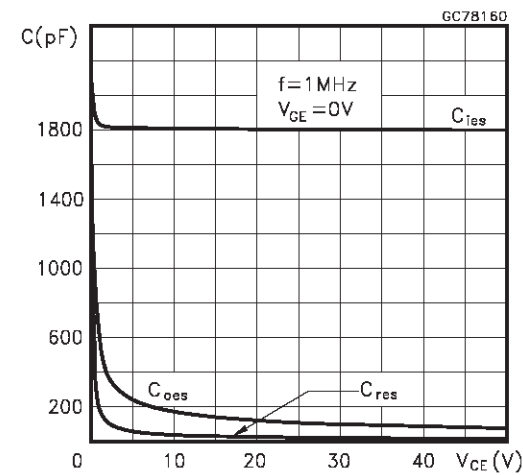
Collector-Emitter On Voltage vs Temperature



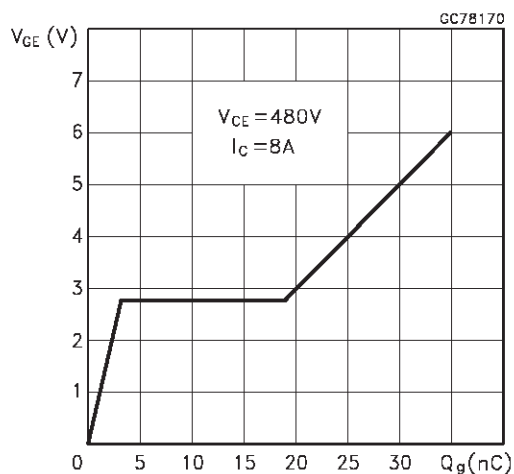
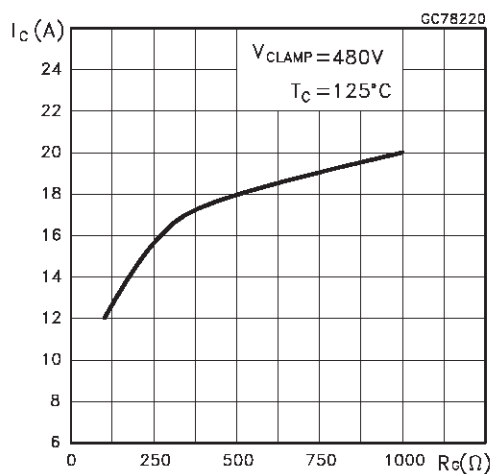
Collector-Emitter On Voltage vs Collector Current



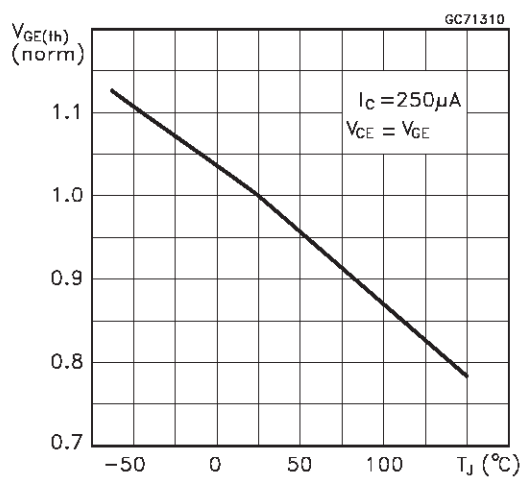
Capacitance Variations



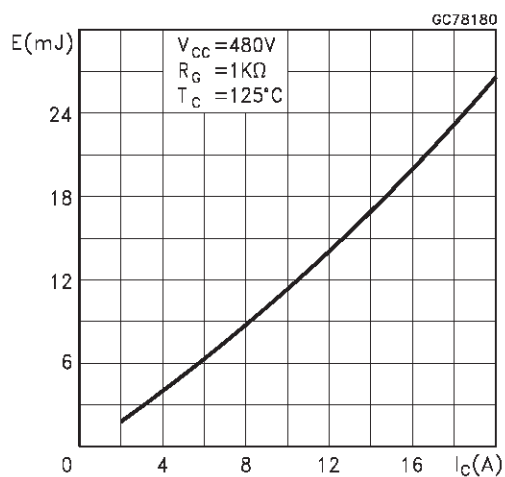
Gate Charge vs Gate-Emitter Voltage

Latching Current vs  $R_g$ 

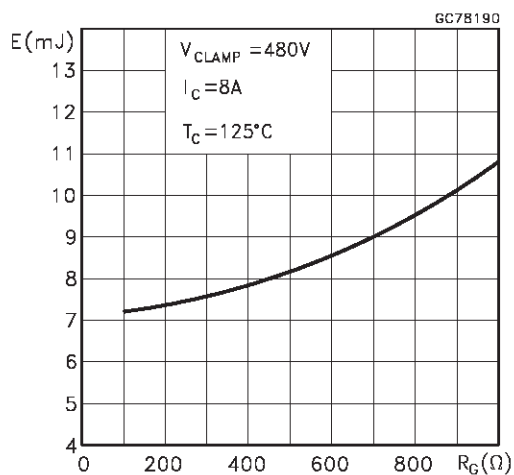
Gate Threshold vs Temperature



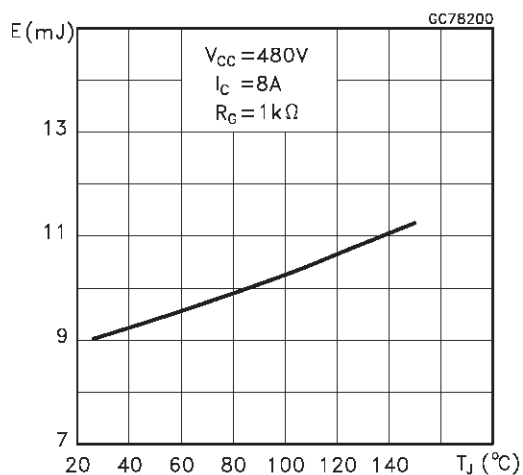
Off Losses vs Collector Current

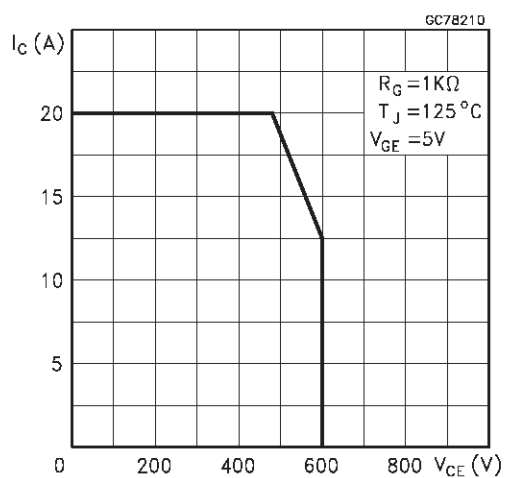


Off Losses vs Gate Resistance

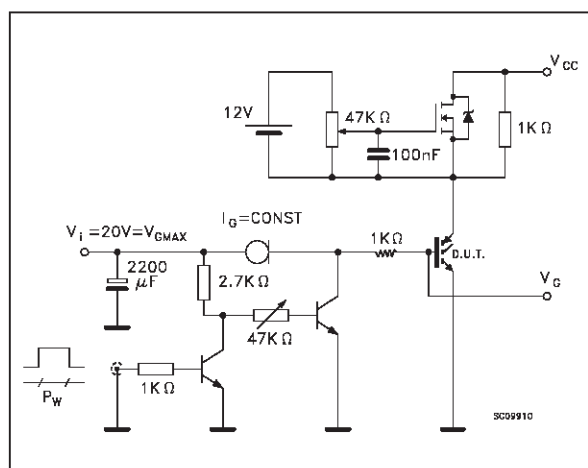


Off Losses vs Temperature

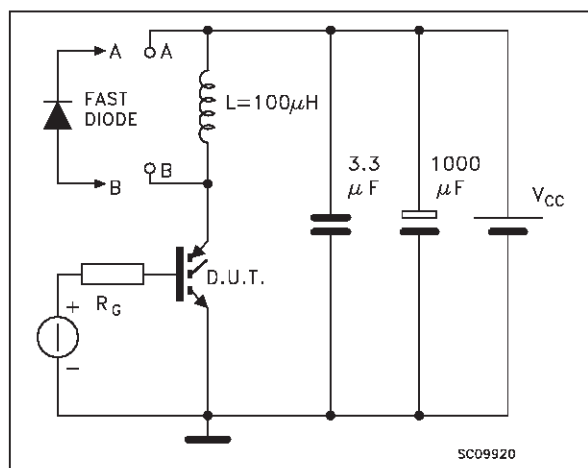




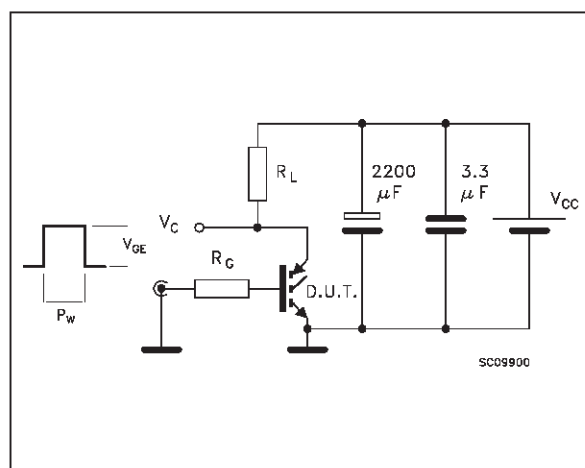
**Fig. 1: Gate Charge test Circuit**



**Fig. 3: Test Circuit For Inductive Load Switching**

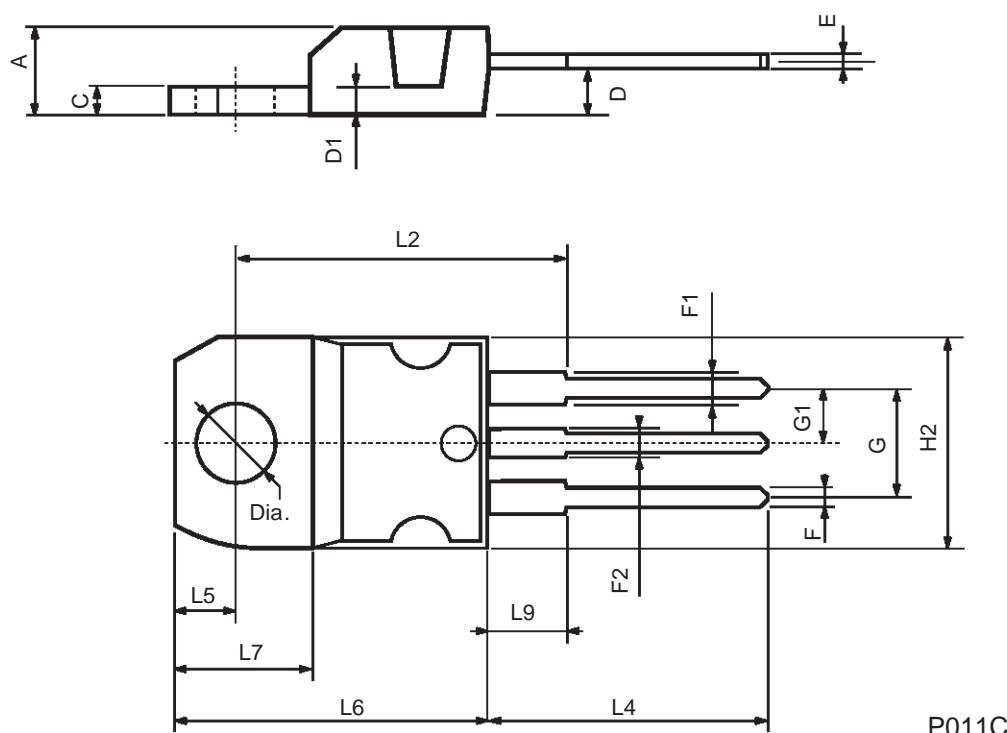


**Fig. 2: Switching Times Test Circuit For Resistive Load**



## TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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